**Scenario Overview**

1. **Legacy Rectangle Class**:
    - The legacy class represents a rectangle using its **width** and **height**.
    - This class has a method that allows drawing the rectangle based on these dimensions.
2. **New GeometricShape Interface**:
    - The new client (which could be a drawing application or API) expects shapes to implement a unified interface called GeometricShape.
    - This interface only works with points (often represented as coordinates) to define shapes, rather than dimensions like width and height.

**Problem Statement**

The main challenge here is that the existing Rectangle class is incompatible with the new GeometricShape interface. The client expects to interact with shapes using a specific format (points) that the Rectangle class does not provide.

**Why Use the Adapter Pattern?**

The Adapter Pattern is useful in this scenario for several reasons:

- **Compatibility**: It allows the legacy Rectangle class to work with the new GeometricShape interface without modifying its original implementation.
- **Flexibility**: The adapter can translate calls from the new interface to the legacy class, enabling existing code to be reused.
- **Separation of Concerns**: It keeps the drawing logic in the Rectangle class separate from the interface that the client interacts with.

**Implementation Breakdown**

**Step 1: Define the GeometricShape Interface**

This interface establishes a contract for any shape that the client can work with. For instance:

java

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```
interface GeometricShape {
   void drawShape();  // Method to draw the shape
}
```

**Step 2: Create the Legacy Rectangle Class**

This class has a method to draw a rectangle using width and height:

java

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```
class Rectangle {
    public void draw(int width, int height) {
        System.out.println("Drawing rectangle with width: " + width + " and height: " + height);
    }
}
```

**Step 3: Create the Adapter (RectangleAdapter)**

The adapter class implements the GeometricShape interface and holds a reference to a Rectangle. It converts calls to the drawShape() method into calls to the draw() method of Rectangle:

java

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```
class RectangleAdapter implements GeometricShape {
    private Rectangle rectangle;

    public RectangleAdapter(Rectangle rectangle) {
        this.rectangle = rectangle;  // Initialize with the legacy rectangle
    }

    @Override
    public void drawShape() {
        // Here we define how to convert the interface to the legacy method
        int width = 10;  // Example width
        int height = 5;  // Example height
        rectangle.draw(width, height);  // Call the legacy method
    }
}
```

**Step 4: Client Code Using the Adapter**

The client code can now work with the GeometricShape interface, while the actual drawing logic is handled by the adapter, which in turn calls the legacy rectangle method:

java

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```
public class Client {
    public static void main(String[] args) {
```

```
        Rectangle rectangle = new Rectangle();  // Create a legacy rectangle
        GeometricShape shape = new RectangleAdapter(rectangle);  // Create an adapter


        shape.drawShape();  // Now the client can use the adapter to draw the rectangle
    }
}
```

**Output**

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Drawing rectangle with width: 10 and height: 5

**Summary**

- **Separation of Concerns**: The adapter decouples the client code from the legacy class, allowing changes in one without affecting the other.
- **Reusability**: The existing Rectangle class can be reused without modification, demonstrating the Adapter Pattern's key principle of adapting incompatible interfaces.
- **Client Flexibility**: The client can now interact with any shape that conforms to the GeometricShape interface, making the system extensible for future shapes (like circles or triangles) without modifying existing code.

This approach facilitates integrating new functionality while preserving existing code, demonstrating the Adapter Design Pattern's practical application in software design.

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